



# Cancer Magnitude in West Libya and Study the Effect of Dietary Habits in Cancer Incidence and Cancer Treatment using Nanotechnology

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## Publication History

Received: 28 May 2014

Accepted: 07 July 2014

Published: 1 August 2014

## Citation

Amal R. Agila, Mohamed M. Elawayeb, Yousef M. Elgitait. Cancer Magnitude in West Libya and Study the Effect of Dietary Habits in Cancer Incidence and Cancer Treatment using Nanotechnology. *Discovery*, 2014, 22(71), 17-21

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## General Note

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## ABSTRACT

This study is to provide an overview of magnitude of cancer incidence in West Libya from 2009 to 2013 and cancer mortality from 2009 to 2012, to identify the role of bad meal in developing cancer, and to suggest further nano-technology research for treating cancer. Among 1851 cancer patients, 1472 cases (79.5%) occur in people aged above 40 years old. The most affected age by cancers was in males aged 61-70 years and in females aged 41-50 years. Lung cancer is the principal cancer in men accounting for 21% of males cases, while breast cancer is the leading malignancy in women accounting for 34.5% of female cases. Cancer is responsible for approximately 11.7% of death. Among 100 interviewed males and females with colorectal, stomach and liver cancers, 50% of them were eating a lot of red meat and fast foods, whereas 20% of all cases were eating a little of fruits and vegetables. 22% of all cases were more likely to have a positive family history of cancer and 8% of all cases had chronic diseases such as diabetes, hypertension, urinary tract infection and gastritis. Good efforts have been made to improve the treatment of cancer by using nanomedicines in order to enhance the performance of chemotherapy and reduce systemic side effects.

Keywords— West Libya, cancer incidence, mortality, bad meal, nanomedicines.

## 1. INTRODUCTION

Cancer is a significant problem in Libya [2]. Globally, at least, 10 million of new cancer cases are reported every year and may be expected to increase to 15 million every year in near future [7]. Cancer represents the second cause of mortality after cardiovascular diseases [8]. World Health Organization (WHO) addressed that two third of worldwide of cancer deaths are due to four risk-factors. These risk-factors include food-related such as colorectal, prostate, stomach, liver, mouth and pharynx cancers; tobacco-related such as lung cancer; infection-related such as liver, cervix and lymphoma cancers; and hormone-related such as breast cancer [9]. Also, they addressed the relationship between total cancer risks and other factors including dietary habits, smoking, ratio of animal to plant food eaten, the quality of food, cooking methods and lifestyle.

Nutrition is responsible for approximately 30% of all cancer risks in devolved countries and 20% in developing countries. However, a previous study documented that fruits and vegetables, and plant constituents such as fibers, and antioxidants maintain a healthy body and a lower cancer risk [9]. Healthy nutrition is a process in which right food is eaten and used by the body for growth and to replace tissues. It can assist cancer patients get the diet they need to keep up their strength and fight infection [4].

Traditionally, cancer was treated by chemotherapy, radiation and surgery. Cancer treatment by chemotherapy is based on chemicals which used to kill cancerous cells. The chemicals used in the treatment could kill healthy cells which not harmed by cancer. Recently, the field of cancer treatment has been improved by many research groups. They found that the nanotechnology techniques offer new methods which can be used for the targeted delivery of drug molecules to the diseased cells [10, 11]. Based on nanotechnology, nanomedicines have been synthesized from nanomaterials in order to enhance the performance of drugs and reduce systemic side effects [12].

This study aimed to investigate the magnitude of cancer incidence by age and sex in West Libya from 2009 to 2013, to explore cancer mortality from 2009 to 2012, to identify the role of bad meal in developing cancer and to suggest further nanotechnology research for treating cancer.

## 2. METHODOLOGY

### Data Collection and Analysis

Data were obtained from Misurata National Cancer Institute Registry and collected from multiple cities in West Libya including Misurata, Zliten, Khums, Sert, Jofra, Kaser Kayar, Tarhona, Tripoli, Ben walled, Tawarga and Misilata. A total of 1851 cases (942 males and 909 females) were diagnosed with cancer during 2009 to 2013. Data were analyzed and percentage formulas of cancer patients were calculated using Microsoft office excel 2007 program.

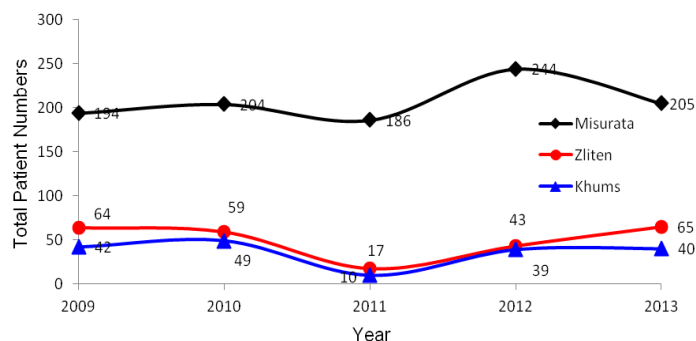
## Cross Sectional Study

A self administered questionnaire was conducted on one hundred Libyan patients aged 45-85 years (58 males and 42 females) at National cancer Institute, Misurata, during the period from November 2013 to March 2014. Patients had colorectal, liver and stomach cancers. Data was collected on a form (questionnaire) during the interview with each patient. Participants were asked to report their dietary habits during one to three years before getting hurt cancer. The questions were only focused on family history of cancer patient, past medical history, life style factors including eating red meat, fast foods and fried potatoes, exercise, smoking status, and eating fruits and vegetables.

## 3. CANCER INCIDENCE IN WEST LIBYA CITIES

Environmental location may be one of risk factors affecting cancer incidence and probably related to a number of other factors, such as great stress [8], cigarette smoking and cultural dietary habits [9]. This implied that some cancer incidences may occur in a specific geographical area. For example, lung cancer is mostly infecting people in West Libya region [7].

Cancer incidence was observed on many cities in west Libya. The most collected data was from Misurata, Zliten and Khums. Figure (1) explains distribution of cancer cases in three cities in west Libya.



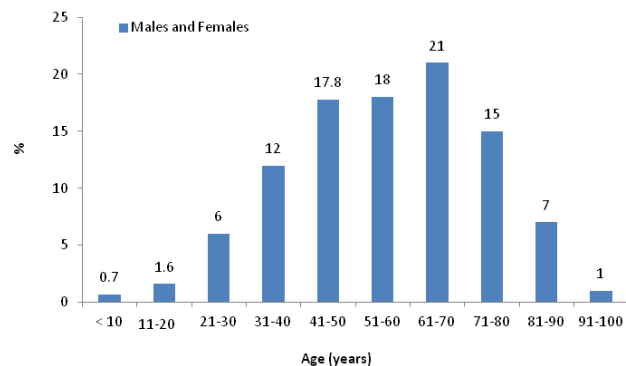
**Figure 1** Region distribution of cancer patients from 2009 to 2013.

## 4. CANCER INCIDENCE BY AGE

Among 1851 cancer cases, 1472 cases (79.5%) occur in people aged above 40 years old. Figure (2) shows continuous rise in number of cancer cases with increasing age. This indicates that most cases were older. The small fall in the age group 91-100 years may be due to this age group having smallest Population.

Approximately, 21% of cancer cases are diagnosed in people aged 61-70 years. About 18% of all cancer cases occur in adults aged 21-40 years. Cancer is relatively rare in kids and teenagers under 20 years and represents around 2.3% of all cancer cases (Figure 2). In 2006, Sabratha Cancer Registry documented that incidence of cancer is the least in the age group below 15 years

[7].



**Figure 2** Total percentage of distribution of males and females with cancer according to age from 2009 to 2013 in west Libya.

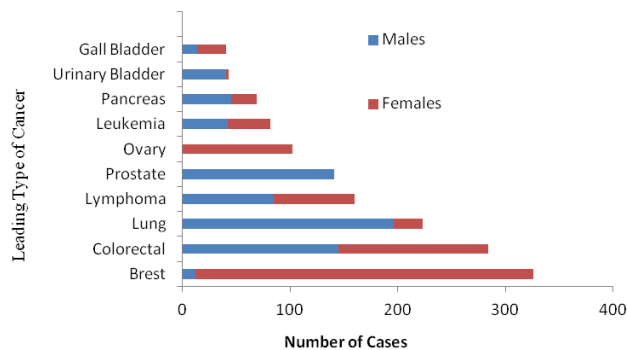
Comparing males to females separately, the higher cases infected by cancer were detected in a specific age period in each gender. The most affected age by cancers was in males aged 61-70 years and in females aged 41-50 years. This explains that progress in the age may affect differently on men and women with cancer.

## 5. CANCER INCIDENCE BY SEX

The approximate percentage of men and women with cancer was 51% and 49%, respectively. This indicates that men are almost 2% more likely than women to develop cancer. Excluding breast cancer, the percentage of men and women with cancer was 50% and 32%, respectively. This implied that men are almost 18% more likely than women to develop cancer. This difference is due to difference in incidence at various body organs [7]. Gender-specific incidences were observed substantially between West Libya cities. For example, prostate cancer occurs only in males, ovary cancers (females only), lung cancer (mostly in males) and breast cancer (mostly in females) Figure (3).

In the present study, more than 23 different types of cancer were observed, but three common cancers including breast, colorectal and lung account for over 45% of both males and females. Lung cancer is the principal cancer in men accounting for 21% of infected males (12% among all males and females). Lung cancer represents the most common cancer in West Libya [7].

Breast cancer is by far the leading malignancy in women accounting for 34.5% of infected females (17.6% among all males and females). A previous study reported that breast cancer is one of a serious health problem in Libyan women [3, 2] and represents 18.9 % among 100,000 Libyan females [20]. Figure (3) shows the ten main types of cancer in infected men and women in west Libya.



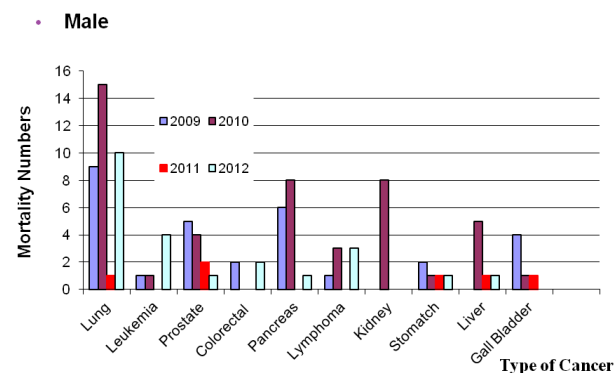
**Figure 3** The ten most common cancers in males and females from 2009 to 2013.

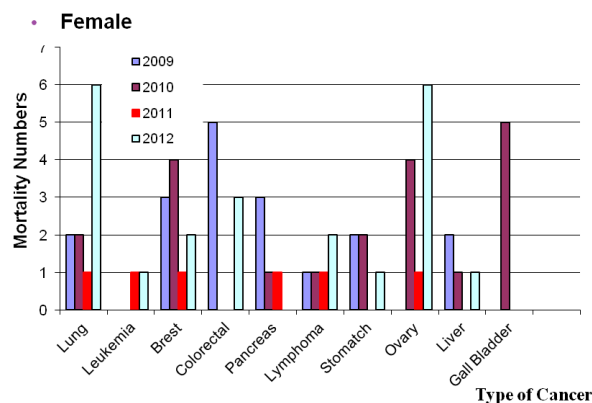
## 6. CANCER MORTALITY

Among all cancer cases, there were 217 cancer deaths (128 males and 89 females) accounting for approximately 11.7% from 2009 to 2012. Cancer mortality was 8.7% of all cases in eastern Libya in the period from 1991-1996 [8]. The increase in cancer deaths in Libya may be due to the lack of improvement in survival rate of major cancers [8]. Also, Libya loses to national cancer control plan like some countries in Middle East [2]. In Arabic countries including Bahrain, Iraq and Kuwait cancer was the major fatal disease and made up more than 10% of deaths [8].

Results showed that men are almost 2% more likely than women to die from cancer in West Libya regions. The high mortality in Libyan males may be related to some gender difference risk factors including diet, tobacco use and occupational exposure to the sun [8]. Worldwide, male deaths represent more frequently than females with cancers [8].

In 2010, respectively, lung, pancreas and kidney were the commonest causes of cancer death in males; while, gall bladder, breast and ovary were the major causes of cancer death in females (Figure 4). Lung and ovary were the most fatal cancers among females in 2012; whereas, colorectal cancer was the major causes of women deaths in 2009. Lung and breast cancers are the most principal causes of cancer death in Libya [2] and worldwide [8].

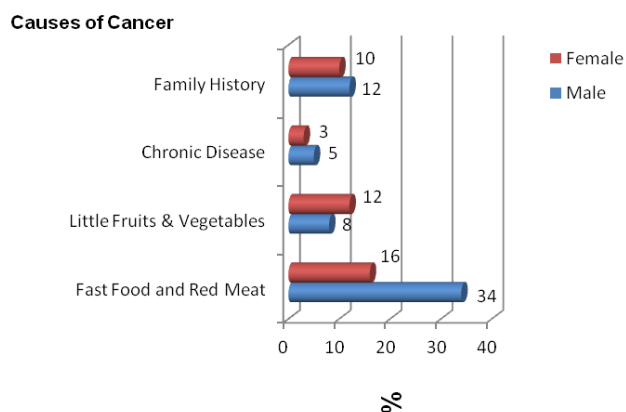




**Figure 4** The ten most common causes of cancer death in males and females from 2009 to 2012.

## 7. DIETARY HABITS AND CANCER

Results demonstrated that 100 interviewed patients with colorectal, liver and stomach cancers were not practiced exercise sports and had low education. 50% of them were eating a lot of red meat, fast foods and fried potatoes, while 20% of cases rarely ate fruits and vegetables (Figure 5). A previous study reported that diet may affect on 30% of all cancer patients [9]. Also, there is a clear association between life style, dietary habits and human cancer incidence [5]. The continuous consumption of red meats (especially in fast foods) including beef and lamb, processed meats and saturated fats may enhance diet-related cancers such as liver and colorectal cancers [6]. At high cooking temperature, these foods may generate different classes of carcinogenic compounds such as heterocyclic amines containing compounds and polycyclic aromatic hydrocarbons. In comparison, diets rich in high-fibers including whole grains, and raw vegetables and fruits may protect from cancer incidence because they are naturally low in fat and rich in antioxidants and anti-cancer constitutes [6]. This food style is mostly vegetarian and may protect against colorectal cancer [5] and stomach cancer and other food-related cancers by supporting the immune system and decreasing cancer risks [1].



**Figure 5** Some causes of cancer.

In addition, 8% of patients had chronic diseases such as diabetes, hypertension, urinary tract infection and gastritis; whereas, 22% were had a positive family history of cancer (Figure 5).

Also, this study found that interviewed men were mostly smokers (90%). Cigarette smokers represent more than 60% of men in Libya [9]. In Eastern Libya, the main reason of some cancers was tobacco related according to World Health Organization (WHO) [2].

## 8. THE APPLICATION OF NANOTECHNOLOGY IN CANCER TREATMENT

Nanotechnology deals with very tiny volumes of materials, which have typical dimensions ranging from subnanometer to several hundred nanometers. Nanostructured materials have attracted much attention in last decade due to their potential applications in industry and nanobiotechnology such as nanosensors [13], magnetoelectronic devices [14] and biological systems [15]. Recently, good efforts have been made to improve the treatment of cancer by using nanomaterial such as nanoparticles and nanotubes [16, 17]. Nanoparticles can be produced from a water insoluble pharmaceutical compound such as organic, inorganic and magnetic materials. The produced nanoparticles are used as nanocarries of drugs to enhance the performance of medicines. The molecules of drugs can be attached to or adsorbed or encapsulated in the nanocarries. This technology has been used to improve drug delivery and to overcome some of the difficulties of drug delivery for cancer treatment [18]. The nanocarries (carries concentrated drugs) can be governed by physiological (pressure) and physiochemical (structure, composition and charge) properties [19].

Based on nanotechnology, the carbon nanotubes were used to transport anticancer drugs or radionuclides for cancer therapy using two methods [17]. The first one is to form non-covalent compounds between the nanotubes and the drugs or the radionuclides, while the second technique is depending on the binding of the combinations to the tubes. The research groups still work to improve the cancer treatment by using nanomaterials such as magnetic nanoparticles and nanodots.

## 9. CONCLUSION

In West Libya regions, men are almost 2% more likely than women to develop cancer, and they are almost 2% more likely than women to die from cancer. The most affected age by cancers was in males aged 61-70 years and in females aged 41-50 years. Lung cancer is the principal cancer in men accounting for 21% of infected males, while breast cancer is the leading malignancy in women accounting for 34.5% of infected females.

Our finding strongly suggests that mixed factors including dietary habits such as low levels of fruits and vegetables, high

calorie fat /meat diet, high levels of fast foods; and smoking, environmental exposure, occupational hazards and great stress may be associated with an increase in cancer incidence. However, continuous consumption of fresh fruits and vegetables, whole grains, healthy fat containing foods such as avocado, olive oil and nuts may prevent cancer incidence.

Nanotechnology can be a good way for future research to improve drug delivery and overcome some of the difficulties of drug delivery for cancer treatment.

## REFERENCE

1. Aly, H. F. 2012. Dietary habits and relation to cancer disease in different population, *Arch. Cancer Research*, 1: 1-26.
2. El Mistiri, M., Pirani, M., El Sahli, N., El Mangoush, M., Attia, A., Shembesh, R., Habel, S., El Homry, F., Hamad, S., Federico, M. 2013. Cancer profile in Eastern Libya: incidence and mortality in the year 2004, *Annals. Oncol.*, 21: 1924 – 1926.
3. Ermiah, E., Abdalla, F., Buhmeida, A., Larbesh, E., Pyrhonen, S., Collan, Y. 2012. Diagnosis delay in Libyan female breast cancer. *Bio Med Central*, 5: 2-8.
4. Varmus, H. E. 2013. Overview of nutrition in cancer care. National Cancer Institute [NCI], USA. Available from <http://www.cancer.gov/cancertopics/pdq/supportivecare/nutrition/Patient/page1>.
5. Philips, R. L. 1975. Role of life-style and dietary habits in risk of cancer among seventh-day Adventists, *Cancer Res*, 35: 3513-22.
6. Pippin, J. J. 2014. Meat consumption and cancer risk. Physicians Committee for Responsible Medicine [PCRM], USA. Available from <http://www.pcrm.org/health/cancer-resources/diet-cancer/facts/meat-consumption-and-cancer-risk>.
7. Abusaa, A. 2006. Sabratha Cancer Registry: first annual report: population based cancer registry. African. Oncology Institute, Sabratha, Libya, p 1-60.
8. Singh, R., Al-Sudani, O. E. 2001. Cancer mortality in Benghazi, Libyan Arab Jamahiriya, 1991-96, *East. Mediter. Health J*, 7: 255-273.
9. Tantamango-Bartley, Y., Jaceldo-Siegl, K., Fan, J., Fraser, G. 2013. Vegetarian diets and the incidence of cancer in a low-risk population, *Cancer Epidem. Biomark. Prev*, 22: 286-294.
10. Jain, R. K. 2001. Delivery of molecular and cellular medicine to solid tumors, *Advanced Drug Delivery Reviews*, 149-168, 46.
11. Nevozhay, D., Kańska, U., Budzyńska, R., Boratyński, J. 2007. Current status of research on conjugates and related drug delivery systems in the treatment of cancer and other diseases. *Postepy Hig. Med. Dosw.*, 61, 350–360.
12. Blanco, E., Kessinger, C. W., Sumer, B. D., Gao, J. 2009. Multifunctional micellar nanomedicine for cancer therapy. *Exp. Biol. Med.*, 234, 123–131.
13. Cui, Y., Wei, Q., Park H., Lieber, C. M. 2001. Nanowire nanosensors for highly sensitive and selective detection of biological and chemical species, *J. Science*, 293: 1289-1292.
14. Xu, S., Qin, Y., Xu, C., Wei, Y., Yong, R., Wang, Z. L. 2010. Self-powered nanowire devices. *Nature nanotech*, 5: 366-373.
15. Reich, D. H., Tanase, M., Hultgren, A., Bauer, L.A., Chen C. S., Meyer, G. J. 2003. Biological applications of multifunctional magnetic nanowires, *J.Appl. Phys.*, 93: 7275.
16. Sanvicens, N., Marco, M. P. 2008. Multifunctional nanoparticles—Properties and prospects for their use in human medicine. *Trends Biotechnol*, 26: 425–433.
17. Kam, N. W., O'Connell, M., Wisdom, J. A., Dai, H. 2005. Carbon nanotubes as multifunctional biological transporters and near-infrared agents for selective cancer cell destruction. *Proc Natl Acad Sci U S A*, 102: 11600 – 5.
18. Jain, K. K. 2005. Nanotechnology –based Drug Delivery for Cancer. *Technol. Cancer Research Treat.*, 4: 407-16.
19. O.V. Salata, O. V. 2004. Application of nanoparticles in biology and medicine, *J Nanobiotech.*, 1-6, 2:3.
20. Boder, J. M. E., Abdalla, F. B. E., Elfageih, M. A., Abusaa, A., Buhmeida, A., Collan, Y. 2010. Breast cancer patients in Libya: comparison with European and African patients. *Oncol. Let.*, 2: 323 -330.

## COMPETING INTERESTS

We (authors) declare that we have no conflict of interest.

## ACKNOWLEDGMENT

The authors acknowledge the National Cancer Institute in Misurata for providing the research facilities and Libyan Ministry of Higher Education for sponsorship. Also, we thank Asia Almabruk and Huda Eljunuti for collecting cancer data.